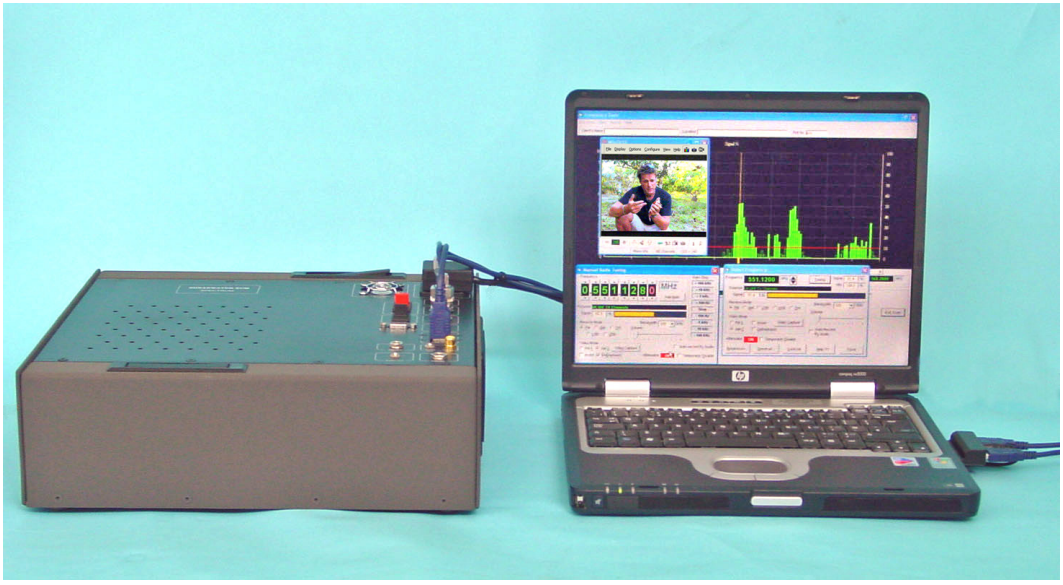
SHEARWATER TSCM
Technical Surveillance Counter Measures

Science and Innovation Centre
Station X, Bletchley Park
Sherwood Drive
Milton Keynes
MK3 6DS, UK

Tel +44(0)1908 677062
Fax +44(0)1908 230732
Mob +44(0)7836 521376
Email info@shearwatertscm.com
Web www.shearwatertscm.com

Spectrum ECM6



User Manual for Windows

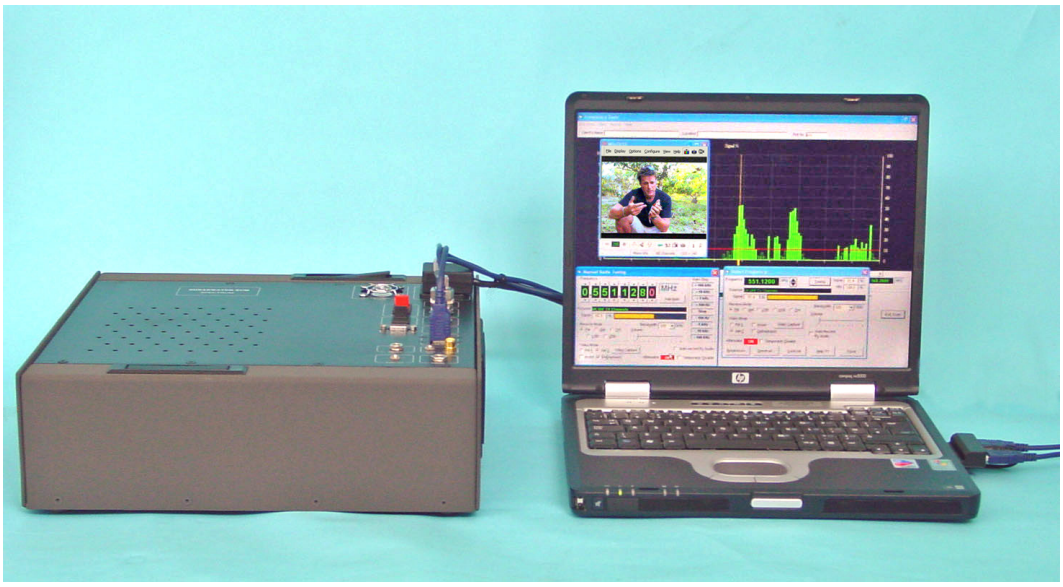
CONTENTS

Overview of the Spectrum ECM6 3
Spectrum ECM6 Control Panel....5
Spectrum ECM6 Assembly....6
Removing the equipment from the case....6
Connecting the Laptop Computer....7
Serial Connection....7
USB Connection....7
Powering up the System....7
System Security....8
Quick start....10
First Scan....11
Your Second Scan....14
Screen shots from your second scan.....16
Viewing and Locking out Scan Data....18
Comparing Scan Data Files....19
Loading A Previously Saved Data File....21
Program in Detail....21
Main Data screen....21
Entering Scan Data....22
Spatial RF Scan....22
Standard Scan – (10 kHz to 3000 MHz)....22
Extended Range Scan – (3000.10 MHz to 6000 MHz)....23
Mains/Line Scan....23
Scan menu....24
Stop Scan....24
Standard Scan....24
Hold on active frequency....24
Resume when cleared....24
Resume when cleared and after delay....24
Resume after delay....24
Possible Threat Warning....24
Spectrum Analyser....26
Manual Tuning....27
Individual Frequency Graph....30
Selecting Frequencies....31
Frequency Breakdown Graph....32

Save data....33
Load data....33
Comparing Data....33
Program Configuration....35
Radio Settings....35
Signal Settings....36
Scanner Options....37
Spectrum Analyser Settings....38
Default Data Folder....38
Auto-save Settings....38
Band Description....38
Band Editor Program....39
Video Demodulation....40
Generating Reports....42
Specifications....43

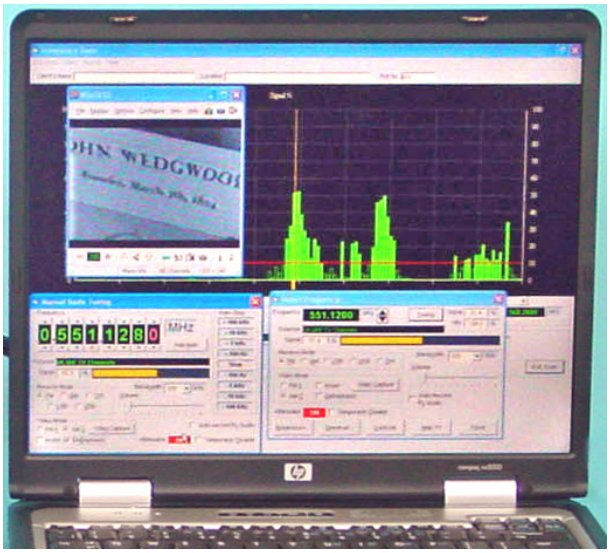
Welcome to the Spectrum ECM6 Manual for Windows™ OS

Overview of the Spectrum ECM6



The complete Spectrum ECM6 system assembled and operational
Note: The antenna is not shown

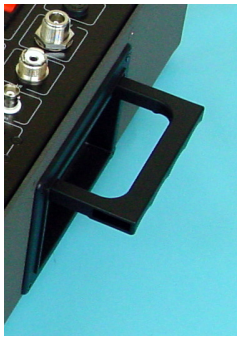
Spectrum ECM6 in the case with antenna (in lid of the case) and its accessories



Laptop Computer
The laptop is a key part running alongside the Spectrum ECM6 unit

The Spectrum ECM6 Receiver

The Spectrum ECM6 Receiver has two hidden handles.
To open a handle press down on one side and rotate fully.
You will need to use these to get the receiver out of the case.



There is also a flip-out carry handle to the right of the receiver.

Spectrum ECM6 Control Panel

Thermostatically Controlled Fan

Power Switch

Receiver Reset / Clear switch

Computer Serial connection

DC Out: To power an optional monitor

Audio Out: for connection to Laptop

Mains Power connector

Fuse

UHF/VHF Antenna socket

HF Antenna socket

Telephone or Cable connection

USB IN: alternative computer connection (from Serial)

USB Out: video capture

Audio & Video Out

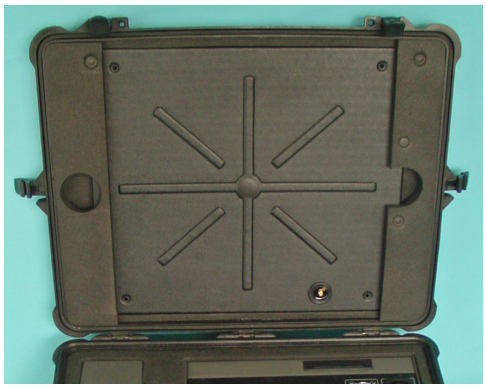
Phones: Headphone socket

Spectrum ECM6 Assembly

Removing the equipment from the case

To remove the ECM6 receiver rotate the two hidden handles to the open position and pull the receiver out gently using both hands. When the receiver is out of the case close the hidden handles.

Removing the large antenna from the lid of the case.



To the right of the antenna is a semi circular cut out, push the antenna to the left until it becomes clear of the foam. Gently ease the antenna forward until it is clear from the foam, then pull the antenna to the right to completely remove the antenna from the case.

At the front of the case is where the antenna stand is stored.

Remove the antenna stand and rotate the feet by 90° to form a cross.
Slide the antenna in to the grooves then connect the antenna lead with an ‘N’ type male connector to the ‘UHF/VHF’ socket and the ‘SMA’ male type connector to the socket on the antenna.

Attach the telescopic antenna with the ‘PL259’ connector to the HF socket then extend the antenna fully.

Connect the power supply to the receiver and to the mains supply.

Connecting the Laptop Computer

There are two ways for the laptop to communicate with the Spectrum ECM6 receiver; by Serial or USB connection.

Serial Connection
Connecting the serial lead (‘9 pin D male’ to ‘9 pin D female’).
Connect the male connector to the RS 232 socket on the receiver and the female connector to the serial port on the laptop.

Insert the USB card into the PCMCIA slot on the laptop and the additional power lead marked ‘Dongle’ to a USB port on the back of the laptop.

Connect the ‘USB Out’ on the receiver to the other socket marked ‘Video’ on the PCMCIA card using the USB lead.

Note: Always use the USB port marked ‘Video’ on the laptop to connect the ‘USB Out’ on the receiver otherwise you will be asked to reinstall the software for the video capture.

Insert the USB Dongle in to the USB adaptor (with lead going to the PCMCIA card) socket on the back of the laptop.

Note: Always plug the USB power lead marked ‘Dongle’ in to the same USB socket on the laptop or you will be asked to reinstall the software.

USB Connection
Insert the USB card into the PCMCIA slot on the laptop and the additional power lead marked ‘Dongle’ to a USB port on the back of the laptop.

Connect the ‘USB In’ on the receiver to the USB socket on the PCMCIA card marked ‘RX’ using one of the USB leads. Connect the ‘USB Out’ on the receiver to the other socket marked ‘Video’ on the PCMCIA card using the other USB lead.

Note: Always use the USB port marked ‘Video’ on the laptop to connect to the ‘USB Out’ and the USB port marked ‘RX’ on the laptop to connect to the ‘USB In’ on the receiver otherwise you will be asked to reinstall the software.

Insert the USB Dongle in to the USB adaptor (with lead going to the PCMCIA card) socket on the back of the laptop.

Note: Always plug the USB power lead marked ‘Dongle’ in to the same USB socket on the laptop or you will be asked to reinstall the software.

Powering up the System
Confirm everything is connected correctly. When ready turn the power on the receiver to the ON position, a green LED on the power switch will light up.

Switch on the laptop, when the Windows™ operating system has loaded there should be some sounds confirming that the connection to the receiver is active and the light on the Dongle should be lit.

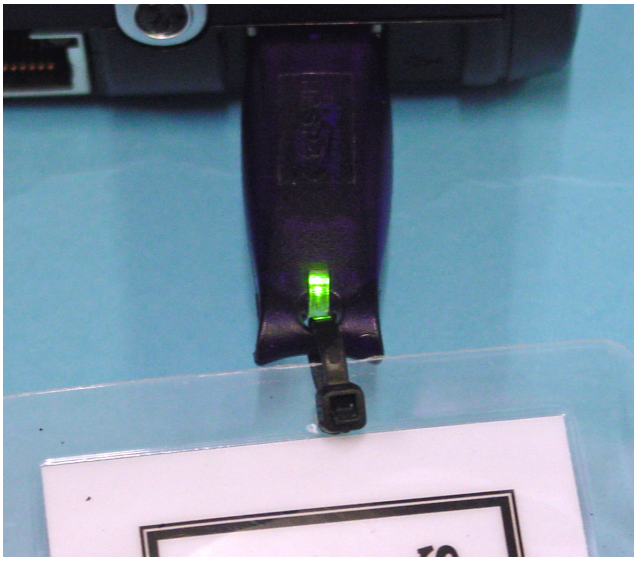
The system is now ready, enjoy analysing the Spectrum.

System Security

Dongle – This is the term for the security key. This is a device that contains vital licence information. Without this device the software will not open, and it is not possible to operate the system at all. It is therefore essential that the Dongle is not lost, and in the event that the laptop is stolen, or there is any attempt to copy the software, the software is secure.

The Dongle (not in use)

The USB Dongle in use, connected to the laptop USB port



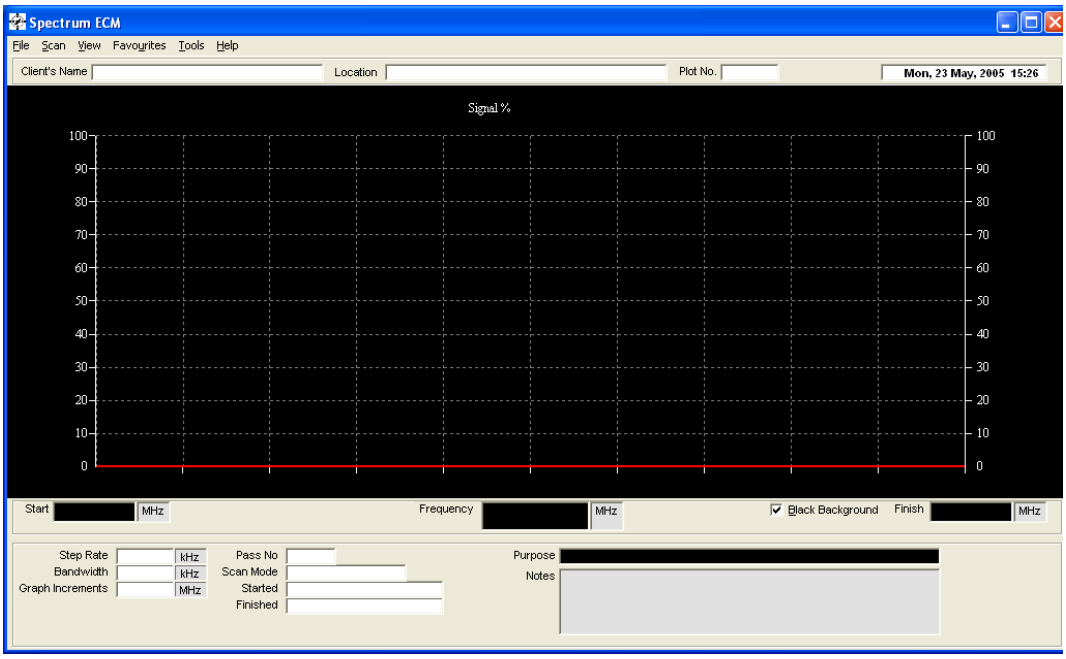
When the Dongle is operational the dongles internal light will be lit either Red or Green.

Quick start

Switch on computer.

Locate and run the Shearwater ECM6 program by clicking Start > Programs > Spectrum ECM6, or click the icon on the desktop.

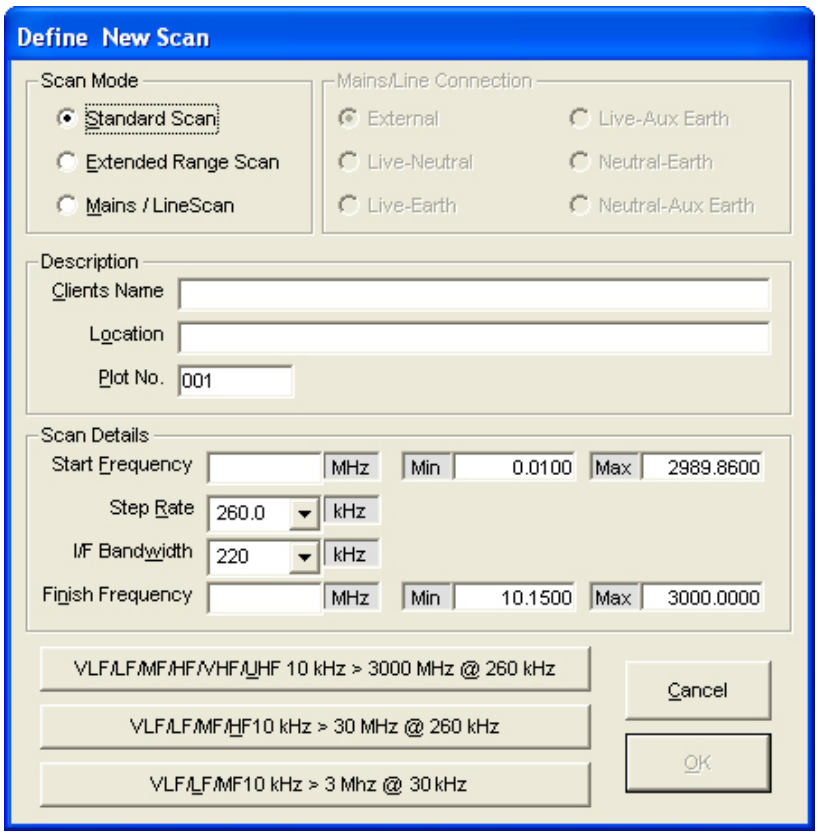
You should now be viewing the Main Screen:



Screen shot of the Main Screen

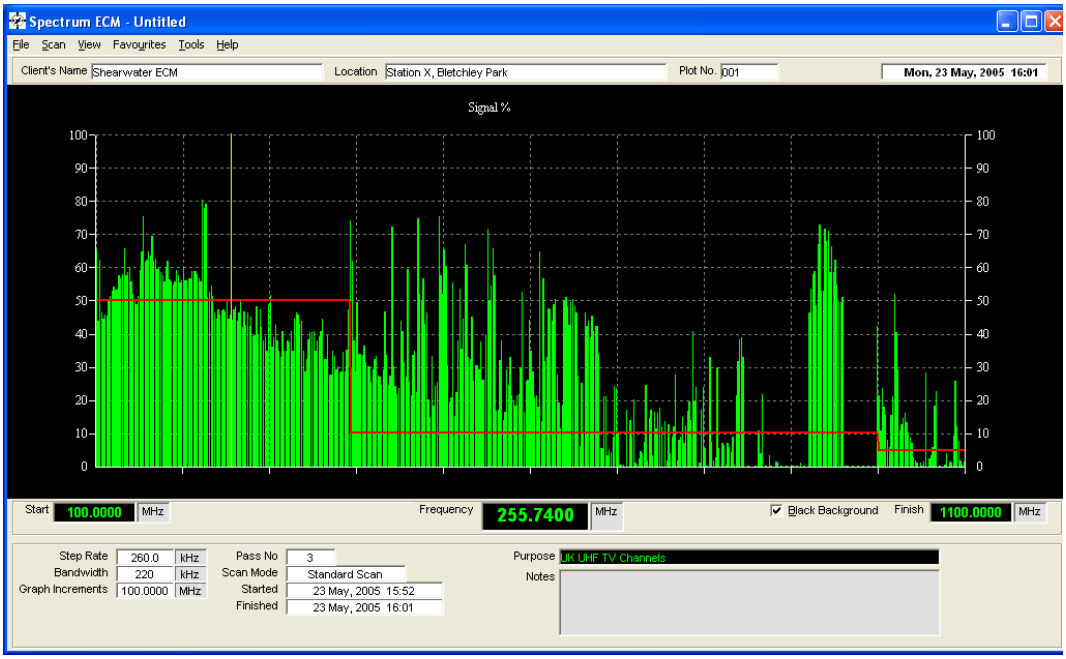
First Scan

Go to File, and select New Scan to start your new scan:



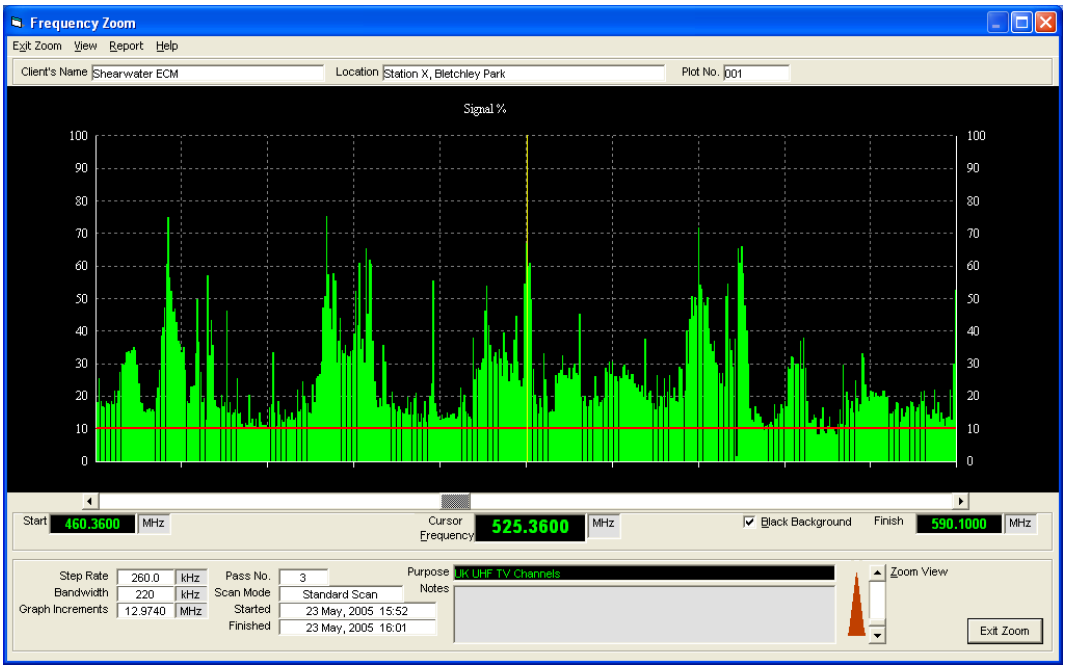
Select Standard Scan for the Scan Mode then enter the Clients Name, Location and Plot number. Type in the Start Frequency and leave the Step Rate at 260 kHz and the Bandwidth at 220 kHz. Type in the Finish Frequency and click OK. You should now see the start, finish and centre frequencies, as well as any other data.

Go to Scan and select Standard Scan to start your scan. Once you have sufficient results, go Scan > Stop Scan to stop your current scan. You should see your results on the computer monitor similar to this:

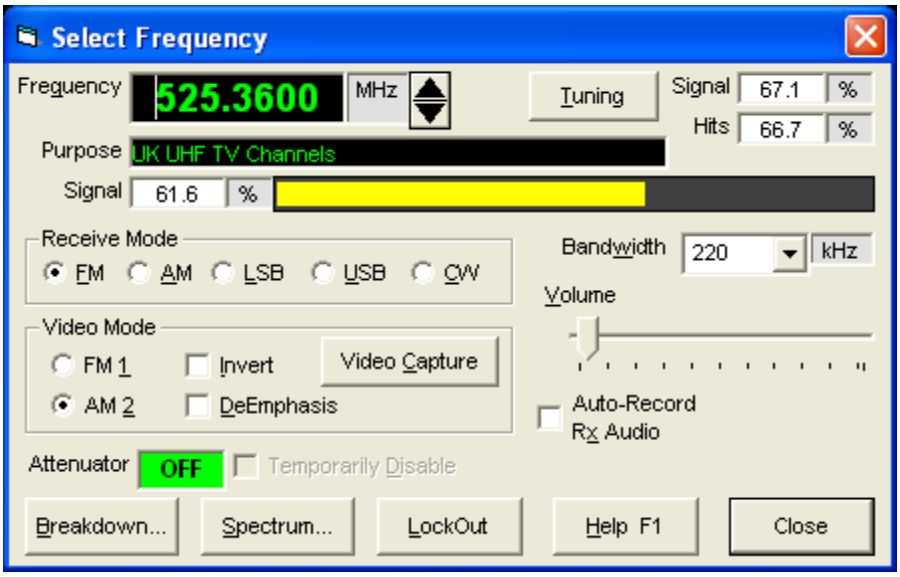


If your computer monitor doesn't show this, you may not have bar chart view selected. For a display in Bar, go to View and select Bar Graph.

You can now zoom in by double-clicking on any area of your scan. Then press Alt and Z together and use the up and down arrows to control the zoom level.



When in the Frequency Zoom window you can listen to a frequency by double clicking on a signal. The Select Frequency window will display.



To control the volume press Alt and V together, and adjust using the right and left arrow keys. To exit this window select either close or the X in the top right hand corner.

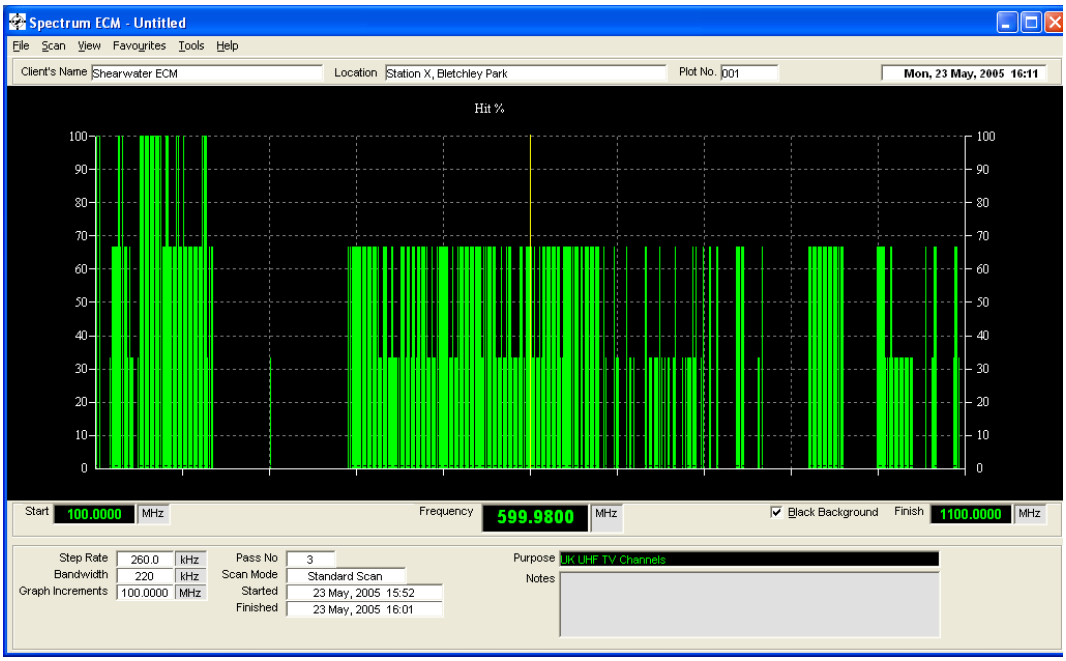
While in the Frequency Zoom window you can experiment with the mouse by double clicking on individual frequencies on the graph or dragging the scroll bar under the graph.

Note: To exit the Frequency Zoom window, just click on the 'Exit Zoom' button near the bottom right hand corner.

Hit% graph

Once you have acquired more than one scan, a graph of Hit% (activity) will be available. To view this, go to View and select Hit% Graph.

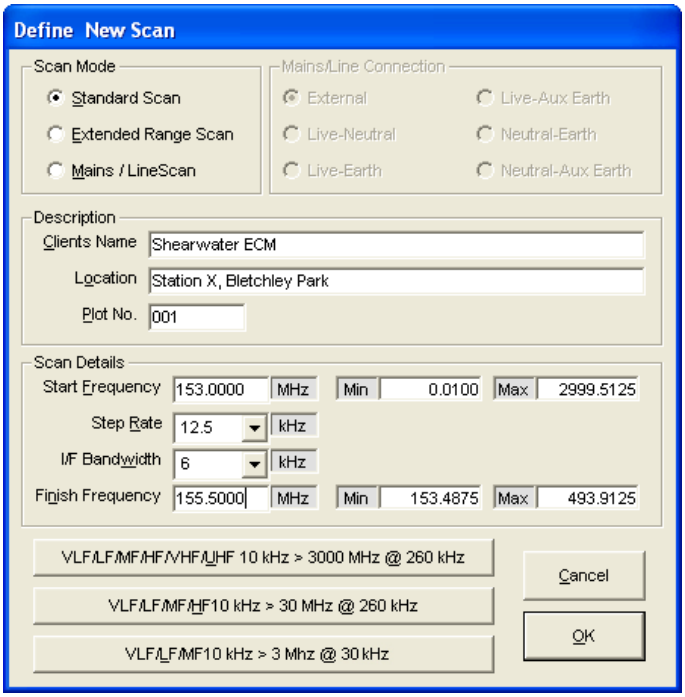
The graph should look something like this:



Once in this view you still have the same options available to you.

Your Second Scan

Now we'll try a different scan, go to File and select New Scan to enter new scan data.

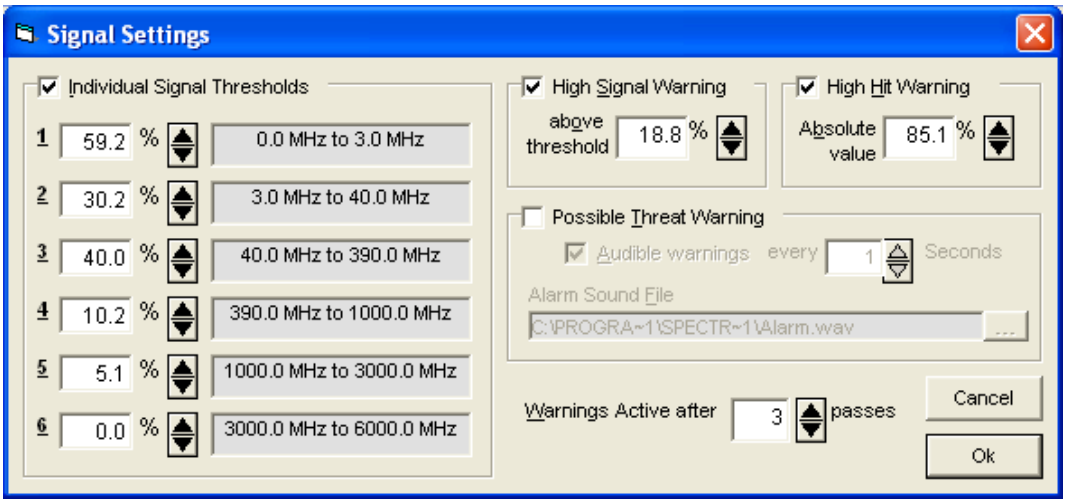


Enter the Clients Name, Location, and Plot Number. Key in the start frequency as 153 MHz and a finish frequency of 155.5 MHz. Enter a step rate of 12.5 kHz and IF Bandwidth of 6 kHz then click OK.

Now start the scan, press Alt+S then S again for a Standard Scan.

Use the view tab to change between Signal% (the signal strength of each frequency), Hit% (how active each frequency is) and Signal dB (shows the decibels of each frequency) graphs. Now switch between Line and Bar graphs.

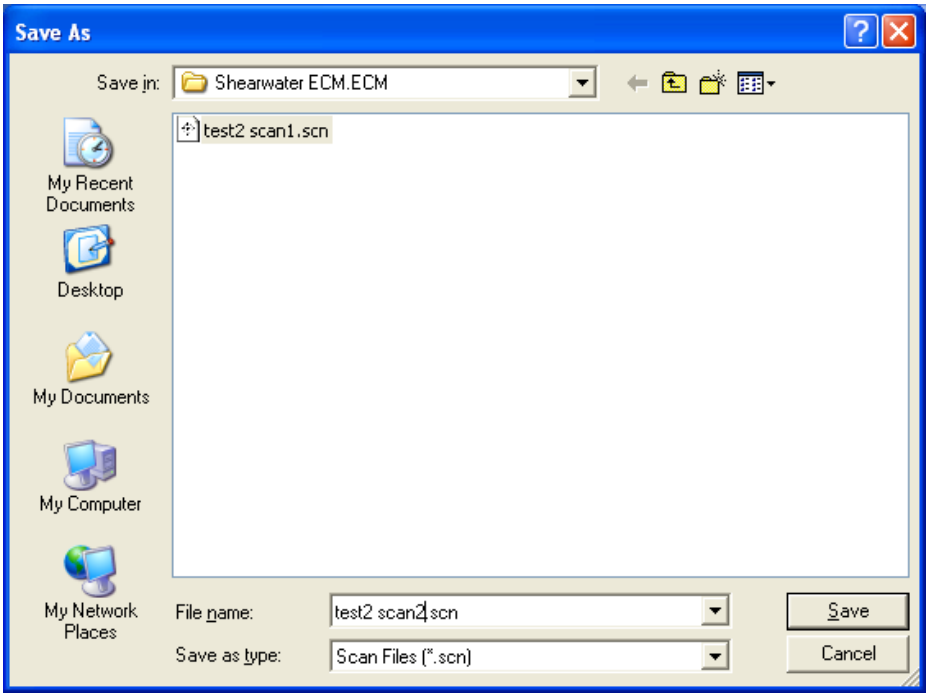
You can set a warning triggered by the Signal% and Hit% when they exceed a chosen percentage, to configure this go to Tools then Configurations and select Signal Settings and choose when you want the warnings to be displayed.


Signal Settings
Individual Signal Thresholds
1 59.2 % 0.0 MHz to 3.0 MHz
2 30.2 % 3.0 MHz to 40.0 MHz
3 40.0 % 40.0 MHz to 390.0 MHz
4 10.2 % 390.0 MHz to 1000.0 MHz
5 5.1 % 1000.0 MHz to 3000.0 MHz
6 0.0 % 3000.0 MHz to 6000.0 MHz
High Signal Warning
above threshold 18.8 %
High Hit Warning
Absolute value 85.1 %
Possible Threat Warning
Audible warnings every 1 Seconds
Alarm Sound File
C:\PROGRA~1\SPECTR~1\Alarm.wav
Warnings Active after 3 passes
Cancel
Ok

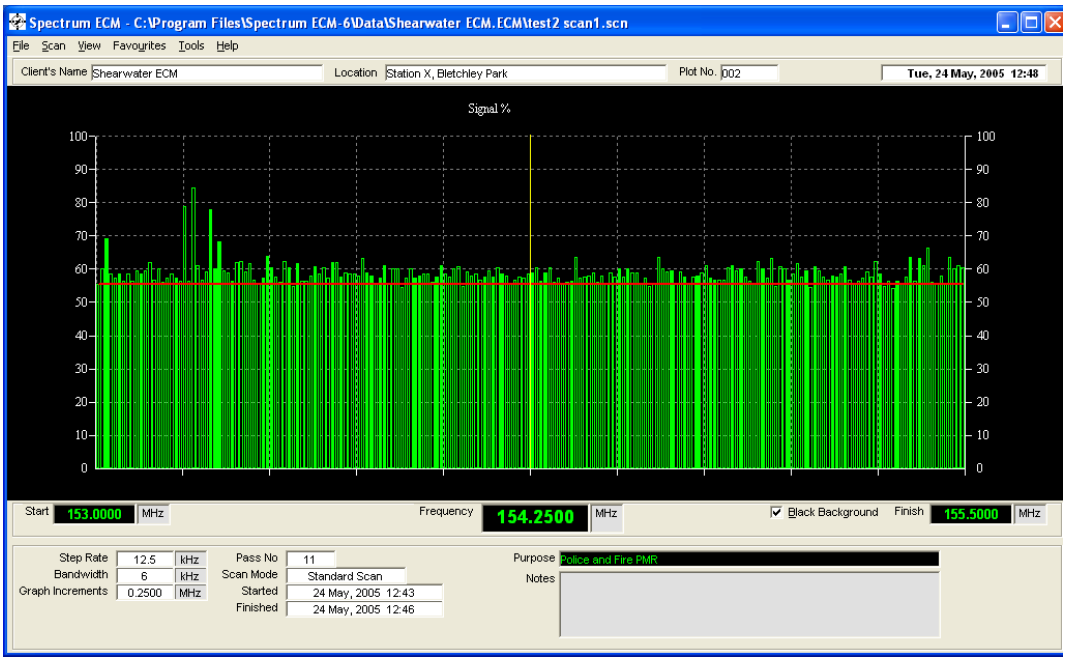
A warning for signal strength will begin when a signal strength over your percentage appears. Once the set number of passes have completed, the High Hit% warning will come into force and show frequencies which have been active for most of the passes; you can set the number of passes in the same dialog box. When both warnings are in place on any one frequency, a 'Possible Threat Warning' is displayed.

Note: You will have to turn some of these settings on, because the default settings are off.

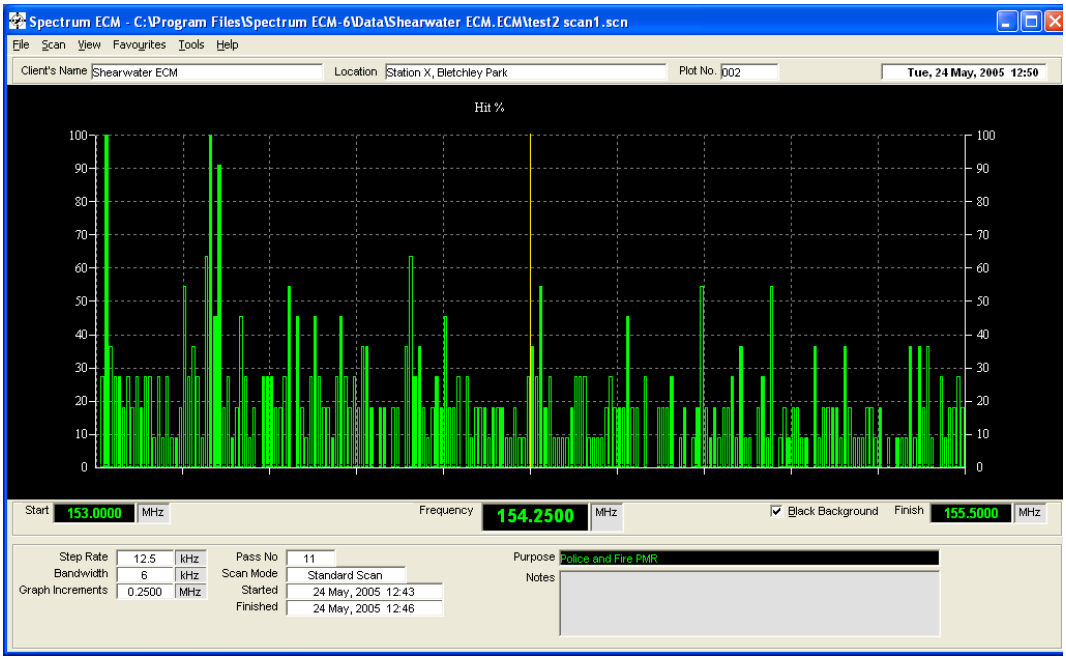
After 10 passes have completed, stop the scan and return to the main data screen. Go to File and select Save File As, choose a filename and save file.



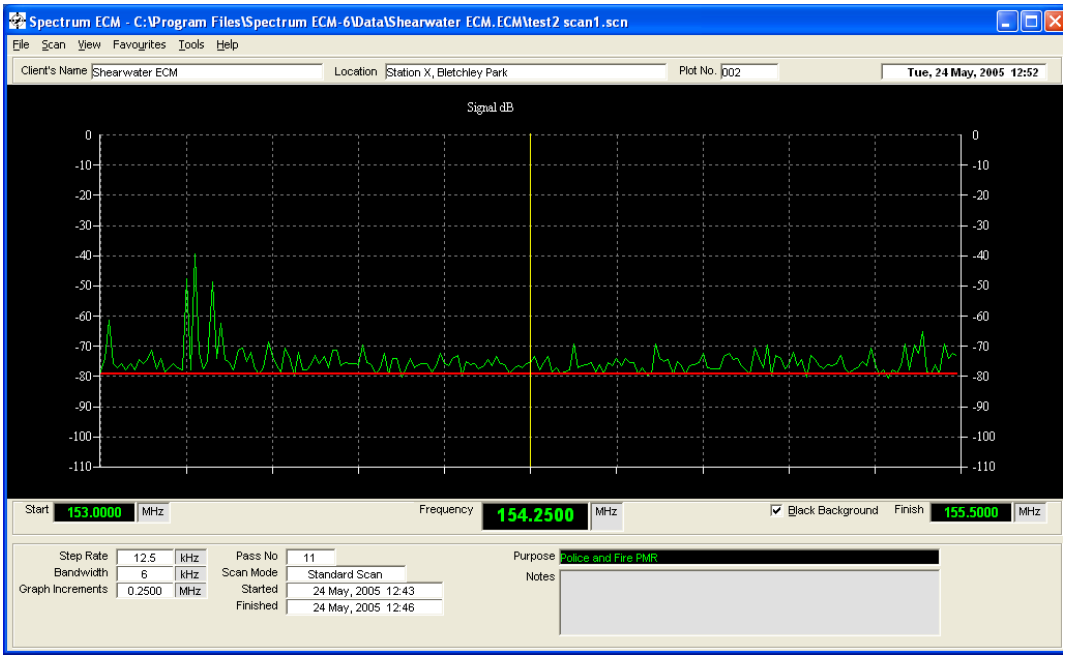
Screen shots from your second scan.



(Signal% graph)



(Hit% graph)



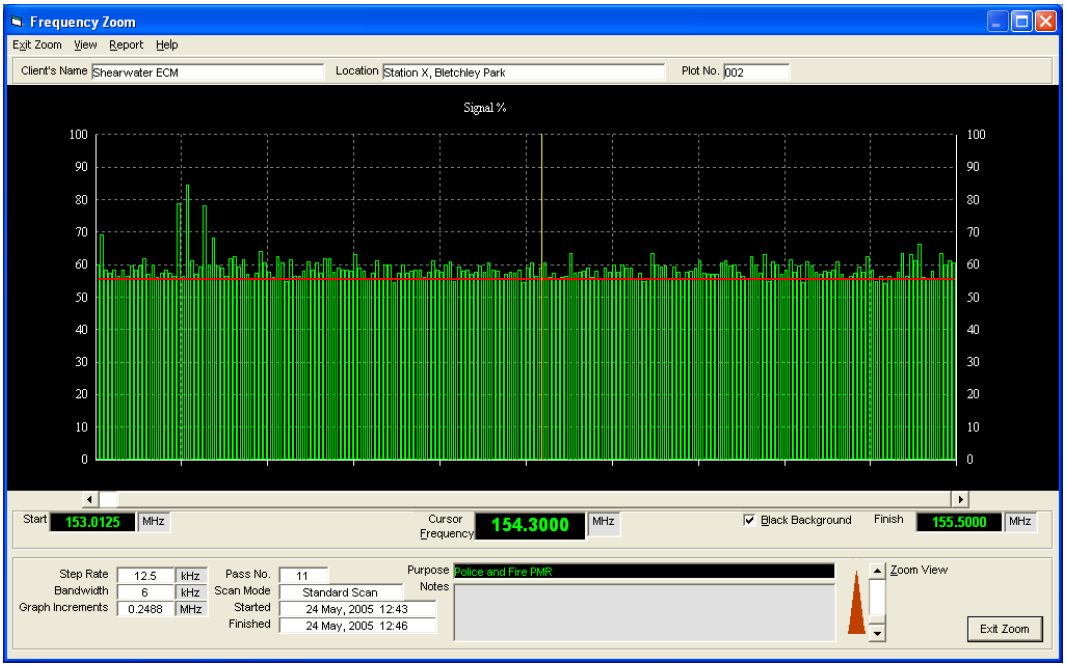
(Signal dB graph)

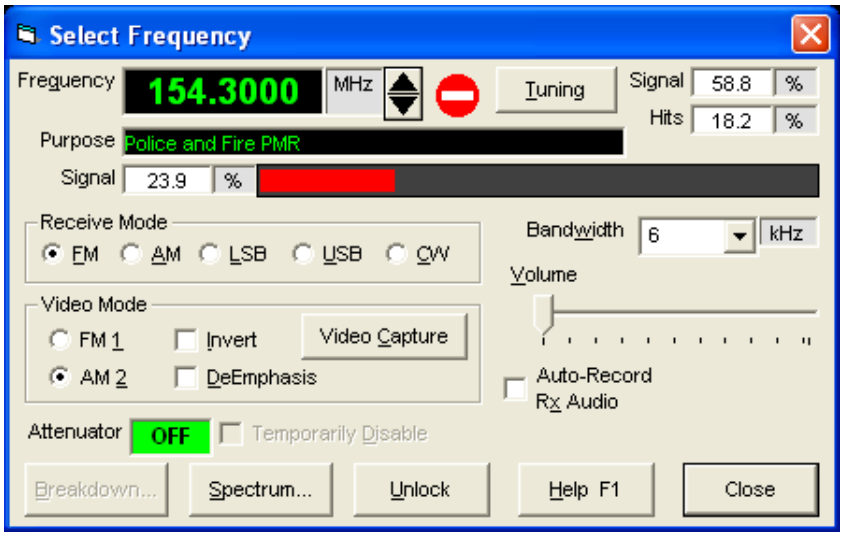
Note: The Signal dB graph is only available in 'line graph' view.

Viewing and Locking out Scan Data

Locking out non-threat signals is a method of refining a scan in order to detect, more readily, new signals of interest.

Upon viewing the scan data, double-click a frequency to zoom in on it, then double-click again to listen to the frequency. If there is no threat then lock this data out by pressing the Lock out button.





To lock out frequencies quicker, just right-click on a frequency in the Frequency Zoom window.

The red circle with a white line shows that this signal is now locked out. You can unlock it at any time by double-clicking on the frequency and pressing the Unlock button.

Return to the Main data screen by pressing ESC twice.

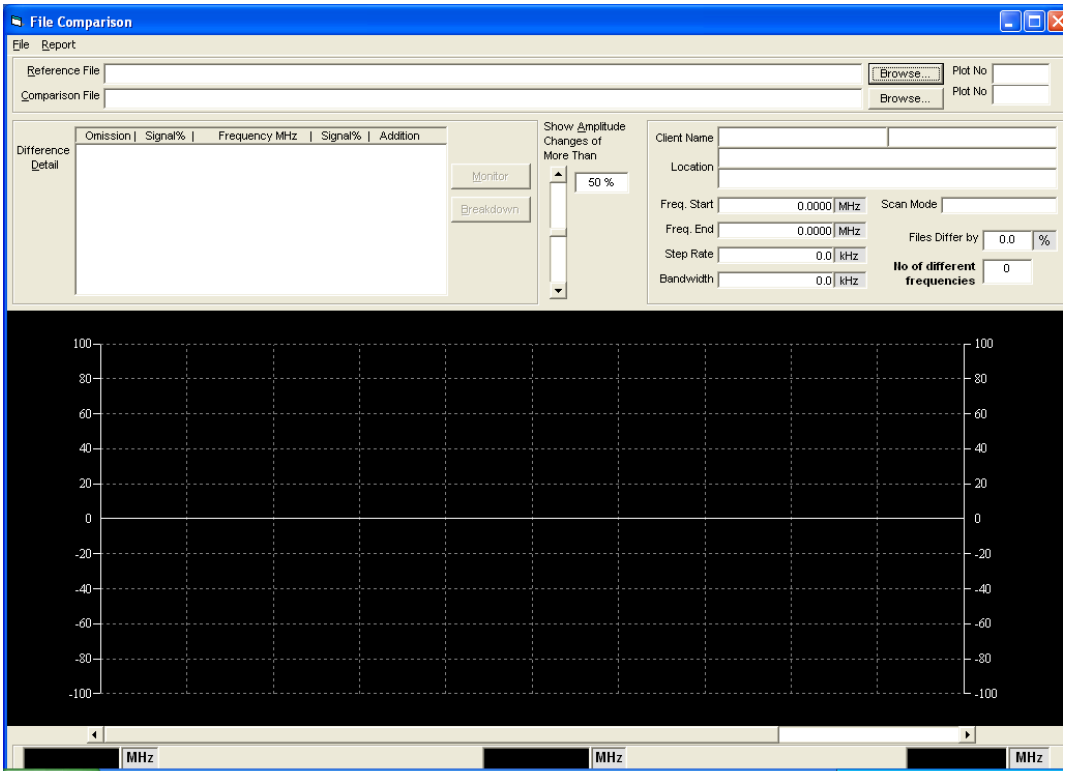
Save the file again with the same filename, and if prompted, say yes to overwrite.

Go to Scan > Standard scan to resume the scan. Select No to resuming the scan. It will start a new scan using the last frequency settings.

Stop the scan after another 10 passes and then save with a different filename. (i.e. Secondscan2.scn)

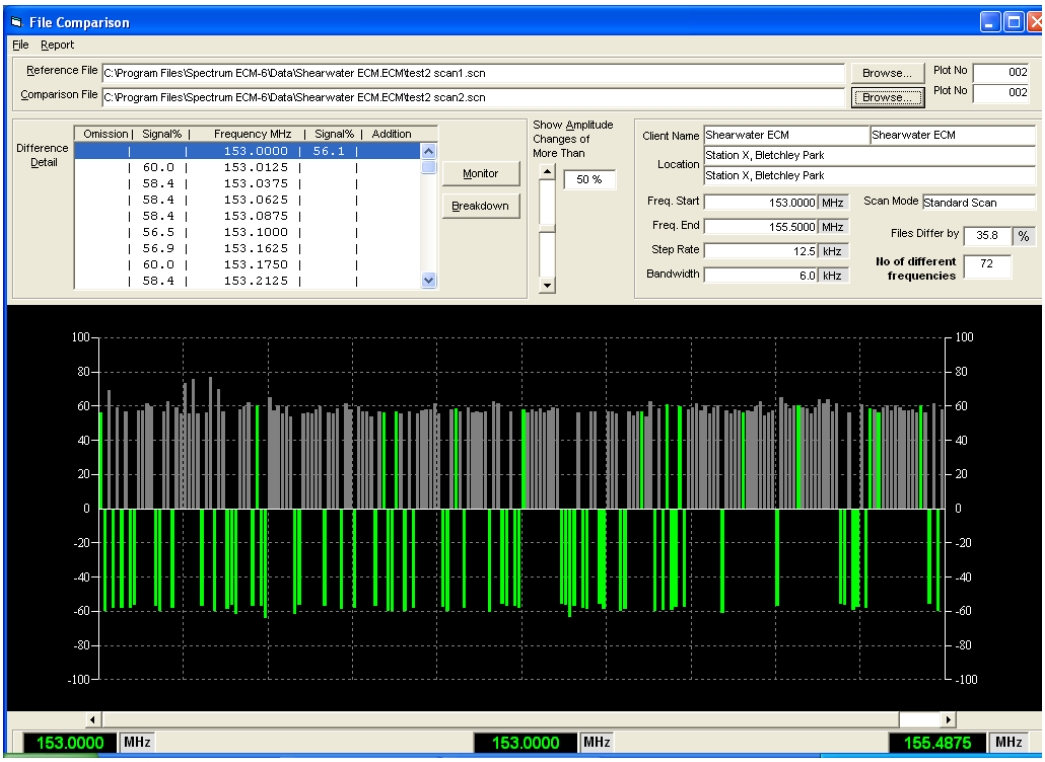
Comparing Scan Data Files

Go to Tools and select Compare Scan Files and you will be asked to choose two files for comparing.

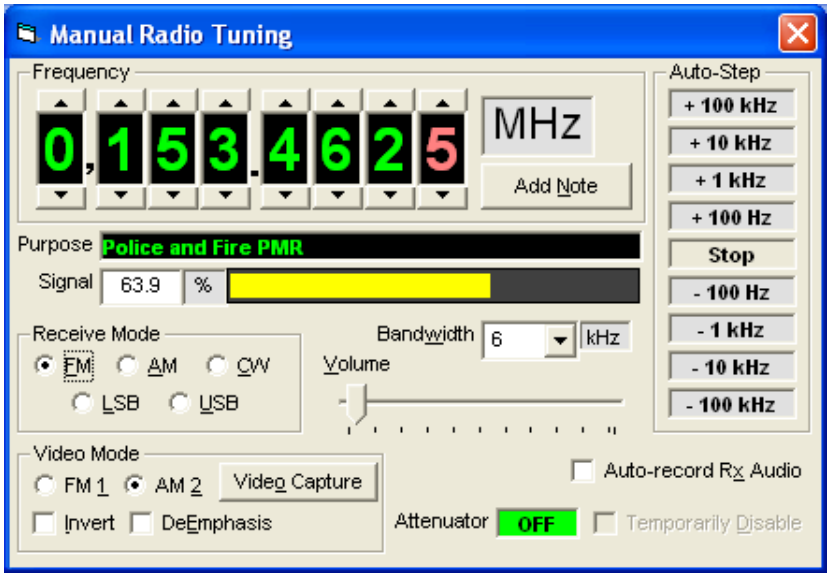


If you had entered a Client name this will have been used to create a folder, with an (.ECM) suffix, for your results, if not, they will be in your default folder.

Using the Browse buttons will ease the selection of similar scans. The program will now compare the two files.



The differences are shown in the ‘Difference Detail’ box at the top, to listen to one of these, click on the frequency and press the ‘Monitor’ button. Control the volume by pressing Alt+V and using the right and left directional arrows.



You can fine-tune the frequency using the arrows above and below each number in the manual tune window.

You can also see the number of different frequencies in a small box on the right of your screen.

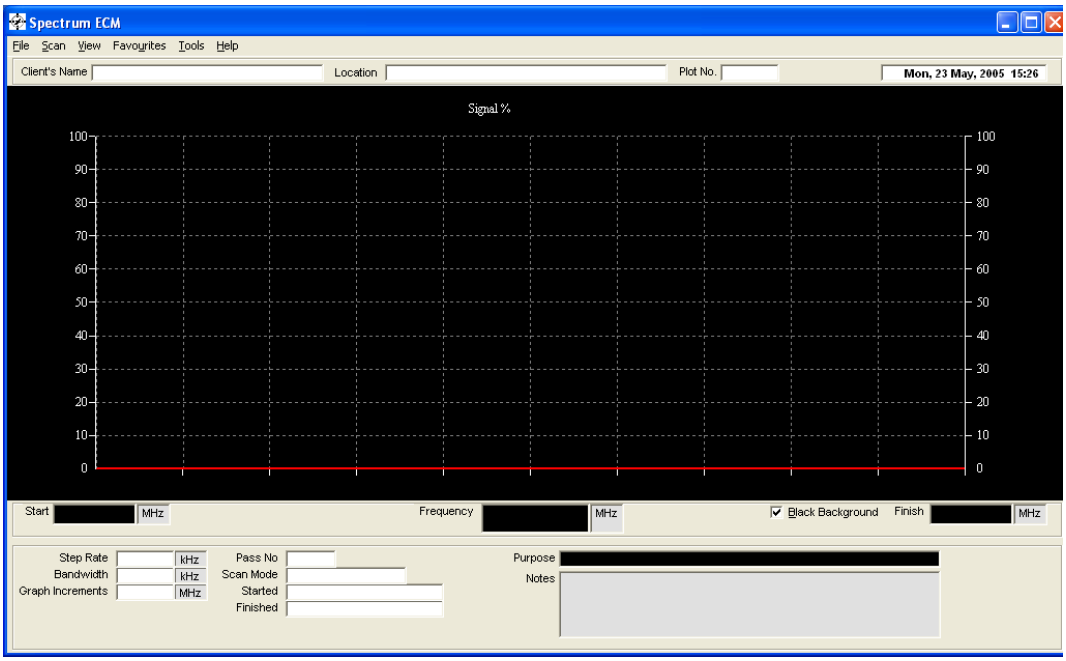
To print in text or graph form, go to the Report tab at the top and choose your desired format. Cross off the window and you will return to the Main Data screen.

Loading A Previously Saved Data File

To reload a file which has previously been saved, go to File and select Open File… and choose the file you wish to load.

Program in Detail

Main Data screen



The Main data screen is the main display for all the data.

From the top left, you have boxes for Clients Name, Scan Location, Plot No., and a date/ time stamp.

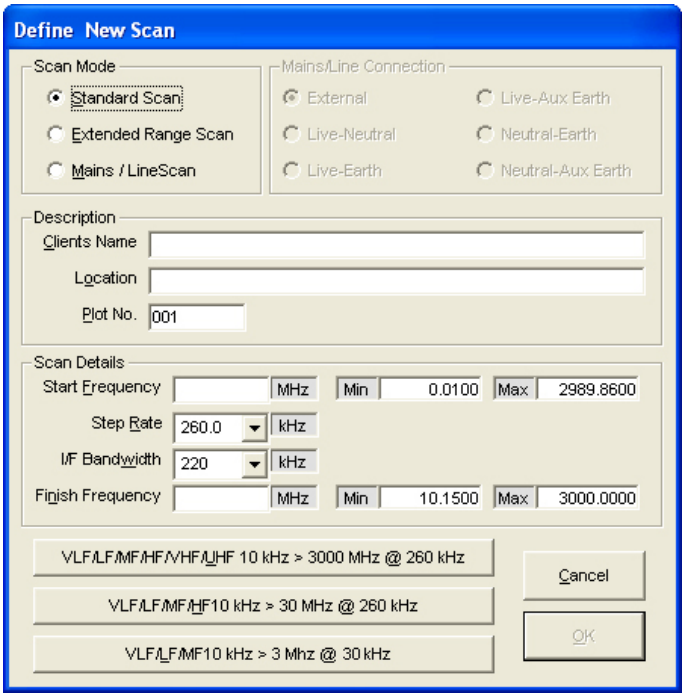
At the bottom you have boxes for Step Rate, Pass No., Bandwidth, Scan Mode, Graph Increments, Time Started, Time Finished, Purpose and Notes.

Also, when you scan, in the black boxes below the graph area, will see the Start Frequency, Mid Frequency and the Finish Frequency.

You can choose to have a black background with the check box towards the right of the screen.

Note: Until you've made a scan, all boxes apart from the date/time will remain empty.

Entering Scan Data



When starting a new scan, you will be asked to enter the scan data, such as Scan Mode, the Start Frequency, Finish Frequency and Client details.

Spatial RF Scan

Standard Scan – (10 kHz to 3000 MHz)

Select Standard Scan.

Enter the Clients Name, this is the name of the company/person you are scanning for.
Now enter the Current location, this will be the town or city in which you are performing the analysis.

Key in the Plot number, which will be used for the filename, and will be placed in a folder of the same name as the Clients name (see above).
You can now enter the start frequency (from 10 kHz and 2989.86 MHz)

Next you enter the Step Rate, which is the space (in kHz) between sampling. If you wanted to scan the frequencies quickly then select a higher Step Rate, but it will not have as many individual frequencies initially selected.

The choices are: 0.1, 1.0, 3.0, 5.0, 6.0, 9.0, 10, 12.5, 15, 25, 30, 50, 100, 110, 220 and 260 kHz.

You now enter the IF bandwidth. This is the amount of frequency spectrum the receiver can look at when tuning to a frequency. A default setting is input, but you can change this.
The settings are: 3, 6, 15, 30, 110 and 220 kHz

Then enter the finishing frequency (from 20.8 MHz higher than the start frequency and 3000 MHz).

Note: At the bottom of the New Scan screen, you will see three pre-programmed scans (10kHz > 3000MHz @ 260kHz, 10kHz > 30MHz @ 260kHz and 10kHz > 3MHz @ 30kHz).

When the scan data is entered, press OK to continue.

Extended Range Scan – (3000.10 MHz to 6000 MHz)

Select Extended Range Scan.

Enter the Clients Name, this is the name of the company/person you are scanning for.
Now enter the Current location, this will be the town or city in which you are performing the analysis.

Key in the Plot number, which will be used for the filename, and will be placed in a folder of the same name as the Clients name (see above).
You can now enter the start frequency (from 3000.10 MHz and 5989.86 MHz)

Next you enter the Step Rate, which is the space (in kHz) between sampling. If you wanted to scan the frequencies quickly then select a higher Step Rate, but it will not have as many individual frequencies initially selected.

The choices are: 0.1, 1.0, 3.0, 5.0, 6.0, 9.0, 10, 12.5, 15, 25, 30, 50, 100, 110, 220 and 260 kHz.

You now enter the IF bandwidth. This is the amount of frequency spectrum the receiver can look at when tuning to a frequency. A default setting is input, but you can change this.
The settings are: 3, 6, 15, 30, 110 and 220 kHz

Then enter the finishing frequency (from 20.8 MHz higher than the start frequency and 6000 MHz).

When the scan data is entered, press OK to continue.

Mains/Line Scan

Select Mains / Line Scan.

Then select one of the following combinations:

Live – Neutral, Live – Earth, Live – Aux Earth, Neutral – Earth or Neutral – Aux Earth

The External option is used for the Line In connection.

Enter the Clients Name, this is the name of the company/person you are scanning for.
Now enter the Current location, this will be the town or city in which you are performing the analysis.

Key in the Plot number, which will be used for the filename, and will be placed in a folder of the same name as the Clients name (see above).
You can now enter the start frequency (from 10 kHz and 19.86 MHz)

Next you enter the Step Rate, which is the space (in kHz) between sampling. If you wanted to scan the frequencies quickly then select a higher Step Rate, but it will not have as many individual frequencies initially selected.

The choices are: 0.1, 1.0, 3.0, 5.0, 6.0, 9.0, 10, 12.5, 15, 25, 30, 50, 100, 110, 220 and 260 kHz.

You now enter the IF bandwidth. This is the amount of frequency spectrum the receiver can look at when tuning to a frequency. A default setting is input, but you can change this.
The settings are: 3, 6, 15, 30, 110 and 220 kHz

Then enter the finishing frequency (from 20.8 MHz higher than the start frequency and 30 MHz).

When the scan data is entered, press OK to continue

Scan menu

- Stop scan
- Standard Scan (no stopping)
- Hold on active frequency
- Resume when cleared
- Resume when cleared and after delay
- Resume after delay

Only available when scan is stopped

- Auto-save data (selected by default)

Stop Scan
Scan > Stop Scan (only available when scanning)

Stops any scan currently in progress

Standard Scan
Scan > Standard Scan

Starts a standard scan with no stopping, using the data you input when on the New Scan window, such as Start Frequency, Finish Frequency, Step Rate and Bandwidth.

The scan will not stop, if you require selection of a frequency: first stop the scan by pressing Stop Scan (see above)

Note: The scan will stop if there is High Hit% and a High Signal% when Possible Threat warning is enabled.

Hold on active frequency
Scan > Hold on active frequency

Starts a scan which goes from the lowest to the highest frequency, during this scan, if a signal is passed which breaks the Signal threshold, it will display an Active frequency window, you can choose to lock out, resume or stop scan.

Note: If you are getting a lot of high Hit% then increase the Signal Threshold for the frequency.

Resume when cleared
Scan > Resume when cleared

This scan will ascend through the frequencies, and do the same as above, but when a signal is cleared the scan will continue.

Resume when cleared and after delay
Scan > Resume when cleared and after delay

Does the same again, but if a cleared signal becomes active within 5 seconds, the process is repeated.

Resume after delay
Scan > Resume After Delay

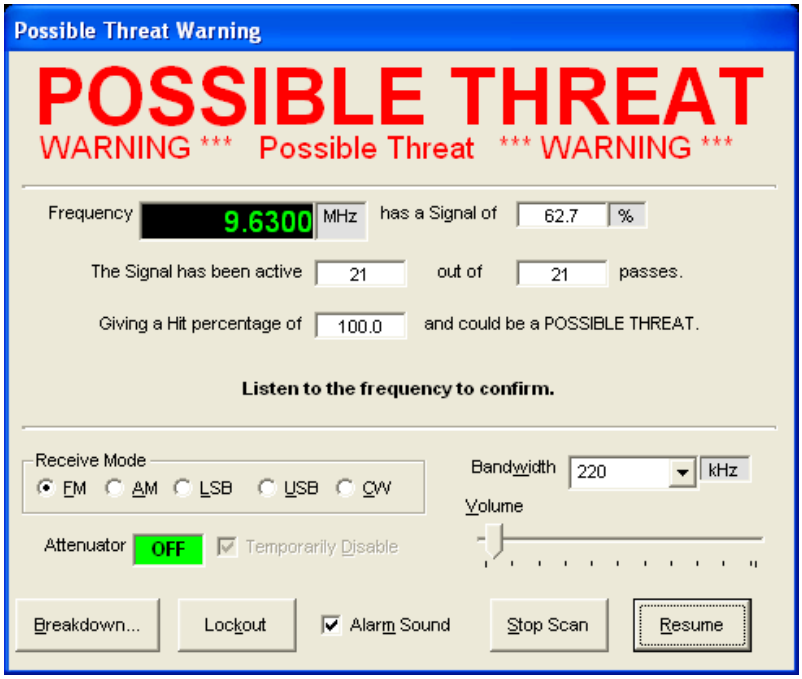
Stops scan when an active frequency is found, then continues after a 5 second delay even if the frequency is still active.

Possible Threat Warning

This is an automatic warning facility. It responds to a combination of High Signal% and High Hit%. There are no fixed parameters for this they have to be selected to match the criteria for the particular locality.

The Signal% is a figure in addition to the threshold level, thus being relative to the threshold level across the entire band of the receiver.

The default setting will assist in evaluating the required values for a specific task.



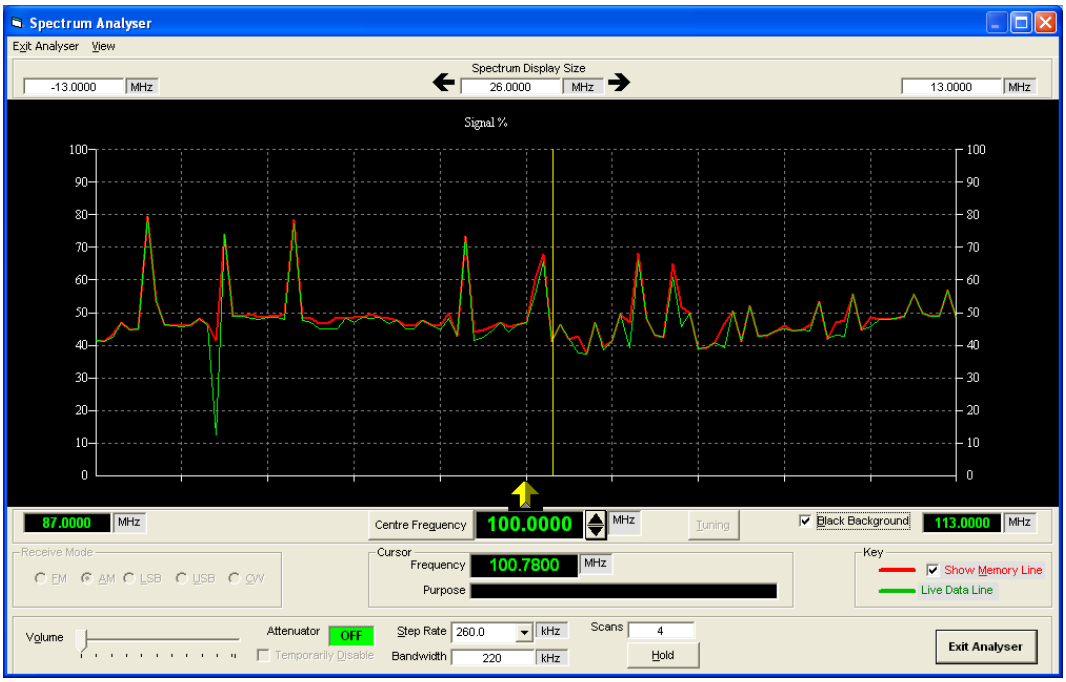
When a frequency is a High Hit% and High Signal%, the Possible Threat window will be displayed and an alarm will sound.

Note: The Possible Threat Warning is not selected by default, it must be turned on in Tools > Configuration > Signal Settings, you can then choose when it comes on and choose if an alarm is sounded. See page 35

The warning sound can be changed as there are several different alarm.wav files available from the menu.

Spectrum Analyser

The Spectrum Analyser is used to interrogate the radio frequency spectrum closely.



When you have one pass completed, you will see a green line (showing the actual trace) and a red line (showing memory). The memory trace can be removed by un-checking the box on the right hand side.

Enter a different Center Frequency by clicking in the middle box. Press enter to accept the new entered data.

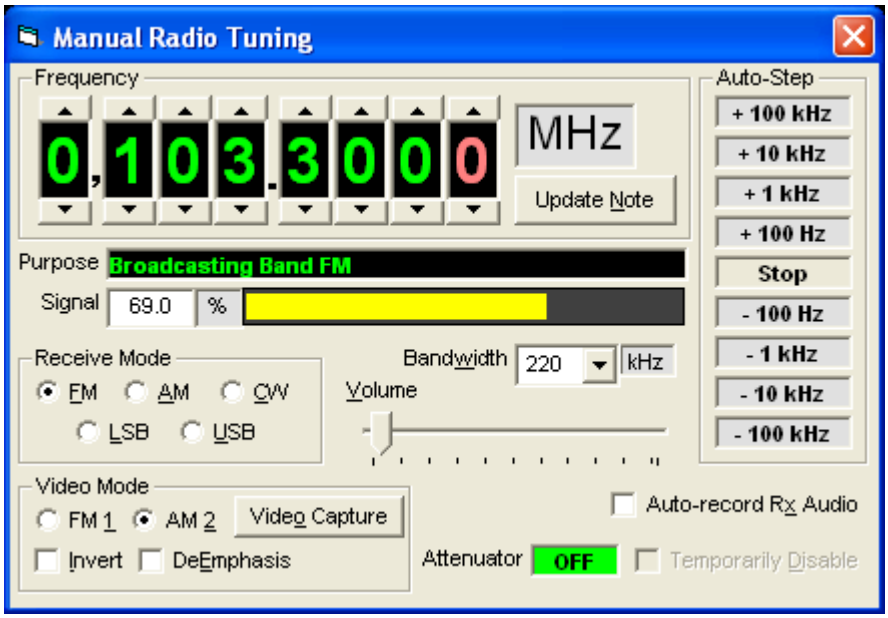
You can also change the Step Rate during a scan, and volume level when on hold (paused). Hold Alt+H to hold a scan and click the resume button to resume it.

Changing the Step Rate will automatically alter the other settings, including the bandwidth and the spectrum size. i.e. reducing the step rate will result in a corresponding reduction in the overall bandwidth scanned. (see below)

Step Rate	IF Bandwidth	Spectrum Display Size
260kHz	220kHz	26.0000MHz
220kHz	220kHz	22.0000MHz
110kHz	110kHz	11.0000MHz
100kHz	110kHz	10.0000MHz
50kHz	30kHz	5.0000MHz
30kHz	30kHz	3.0000MHz
25kHz	30kHz	2.5000MHz
15kHz	15kHz	1.5000MHz
12.5kHz	15kHz	1.2500MHz
10kHz	15kHz	1.0000MHz
9kHz	6kHz	0.9000MHz
6kHz	6kHz	0.6000MHz

5kHz	6kHz	0.5000MHz
3kHz	3kHz	0.3000MHz
1kHz	3kHz	0.1000MHz

Manual Tuning



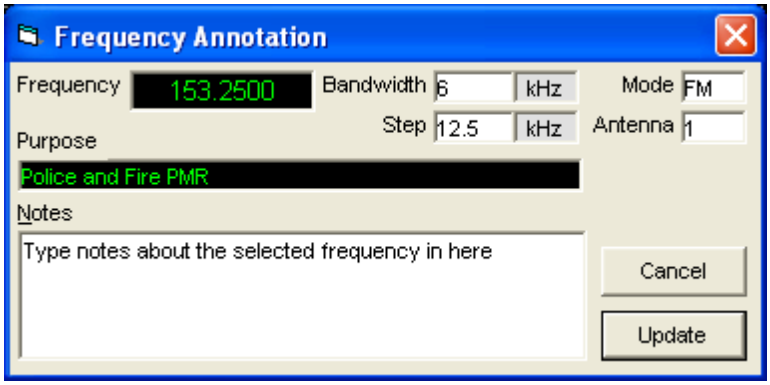
With manual tuning, you can tune more precisely, using smaller increments with the arrows above and below the numbers (top left of screen). You can also use the Auto Step buttons on the right to scan at increments. This will scan indefinitely, up or down, as you set. (press Stop to end scanning).

You can also change the frequency by clicking directly onto a displayed green number. A drop down menu will appear and the required number can be selected by clicking on it.

You have the audio (AM, FM, CW, LSB, USB) and video (FM, AM, Invert, De-Emphasis) options available, as in select frequency mode.

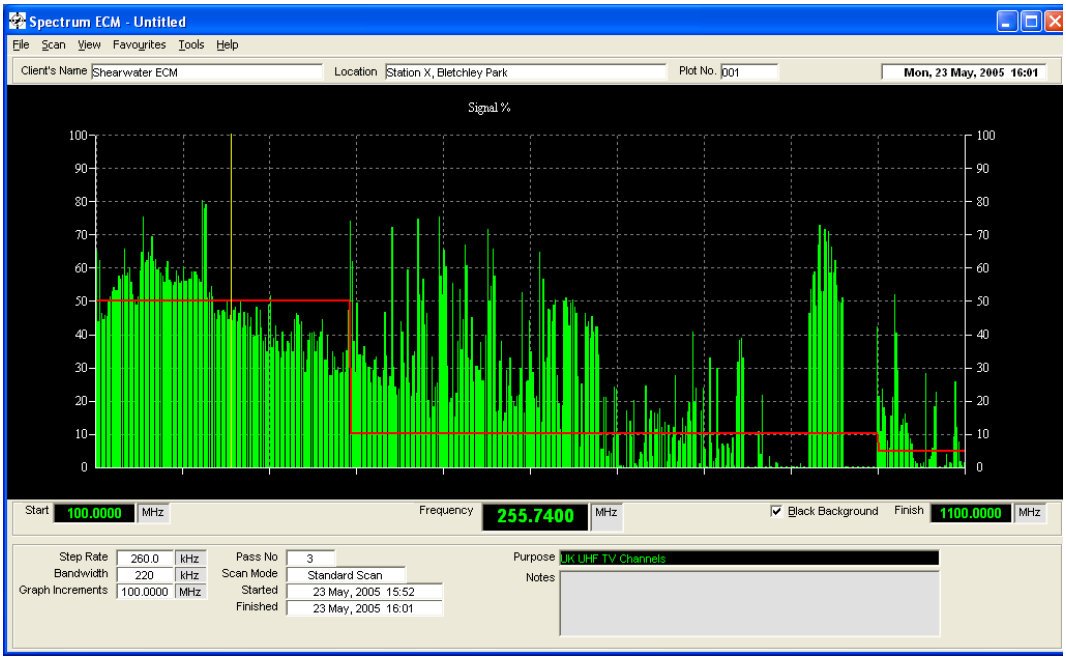
To adjust the volume, press Alt+V and use the left/right arrows on the keyboard.

By clicking on the button Add Note / Update Note the Frequency Annotation window opens. In this window you can add or change any additional notes about the selected frequency.



When you have finished click on the Update button.

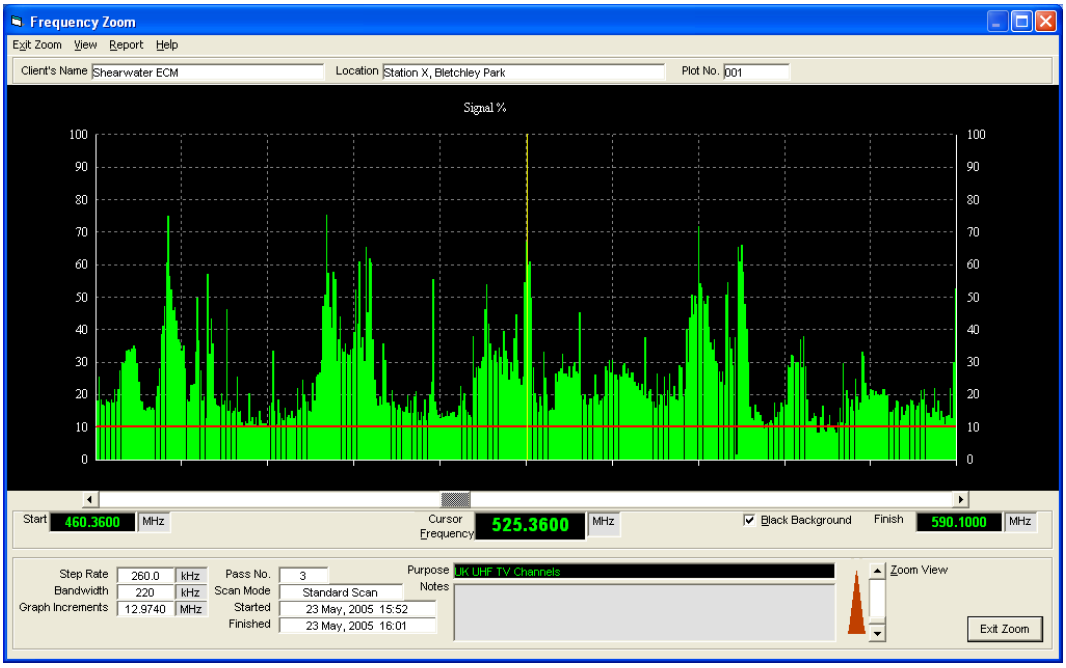
Frequency Spectrum: Scanned Graph



This graph shows all the frequencies that have been scanned, and can allow for close inspection of a frequency.

Underneath the graph are the Start and Finish frequencies, then in the middle is the frequency your cursor is currently on or the centre frequency if your mouse is out of the Graph area.

Individual Frequency Graph

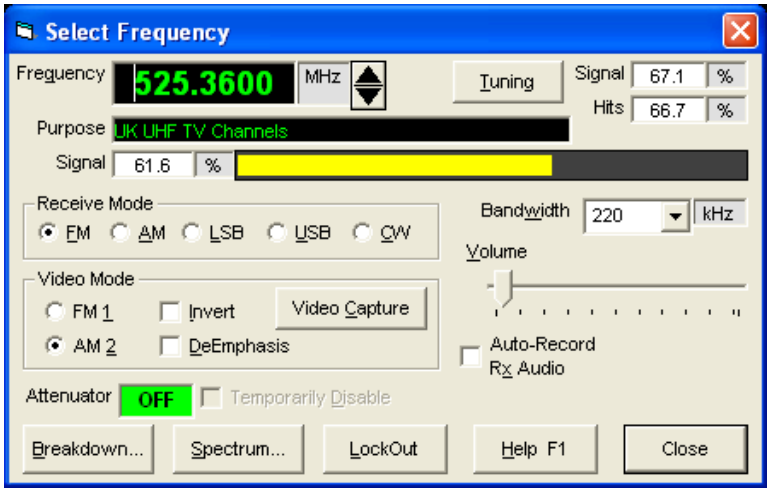


This graph displays the individual frequencies, which can be closely inspected by double-clicking on a selected signal.

Again, at the top of the screen is displayed the Clients Name, Location, and Plot Number.

The middle of the screen is the main graph display.

Selecting Frequencies



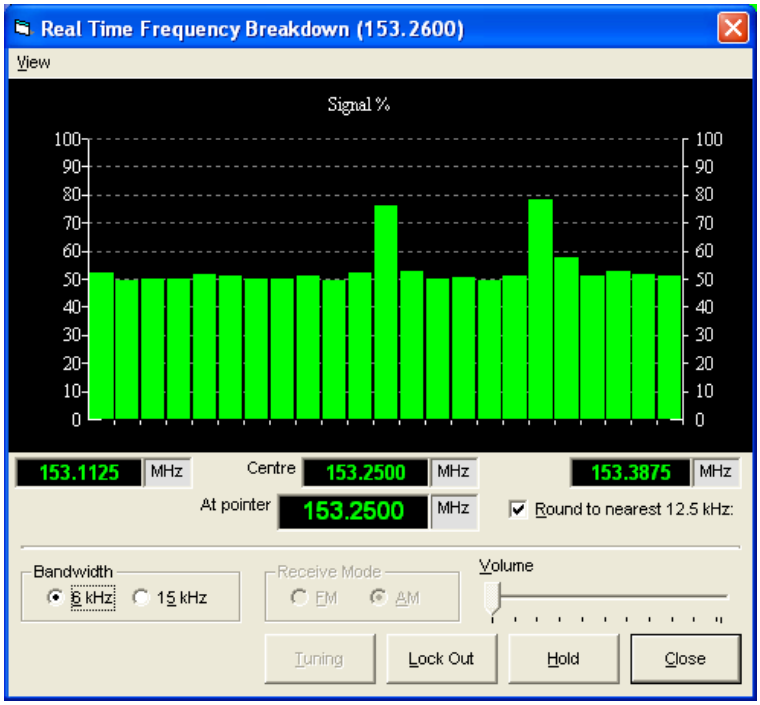
After double-clicking on a frequency, a box will be displayed with the frequency you've selected.

Depending on the signal percentage, the signal will range from red to yellow: yellow being for the strongest signal, and red for a signal below the threshold.

Just press Close or press the <Esc> key, to exit this view.

Frequency Breakdown Graph

Pressing Breakdown from the ‘Select Frequency’ box will display this, the Frequency Breakdown Graph.



This continually scans a small band of frequencies on and about the selected frequency, and updates accordingly.

When you select hold, you can listen to the individual frequencies, and scan through them by moving the mouse cursor left or right on the graph. Just press Resume again to start scanning.

Just press Close or <Esc> to return to the Select Frequency window.

Save data

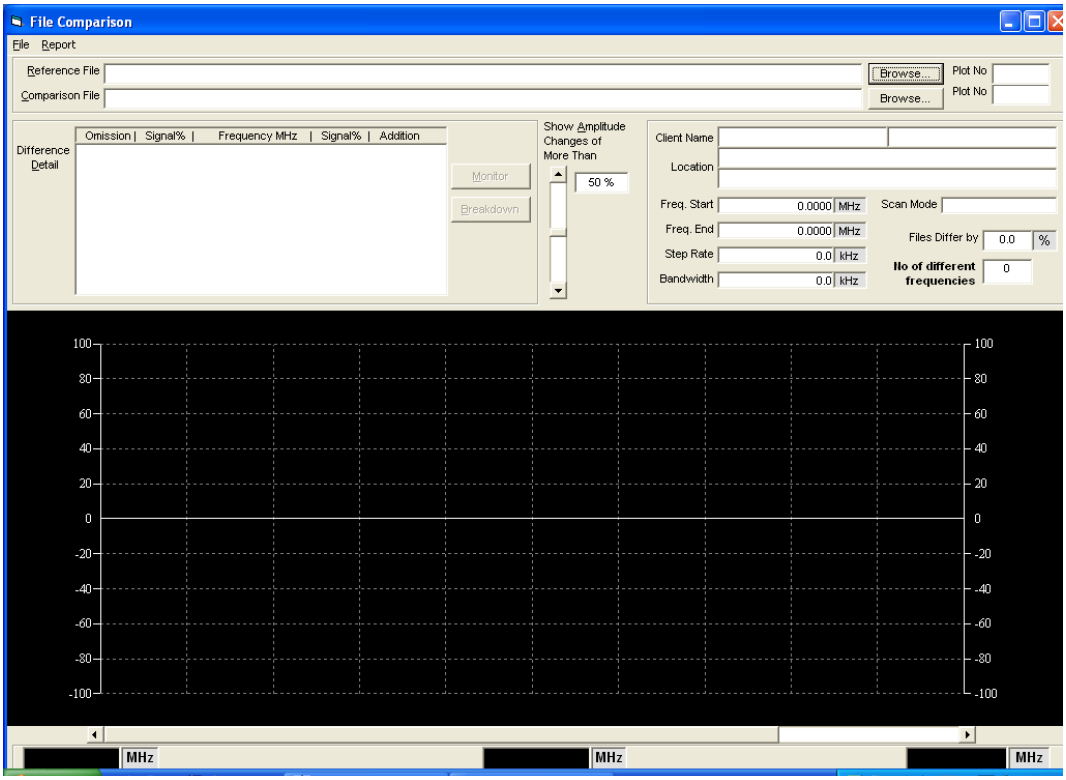
To save a file click File and select Save. You should now enter a filename for your file, and press ok to save.

Load data

To load data previously saved, go to File and select Open File, then choose the file you want, and press OK. When it is loaded you will be back at the main data screen.

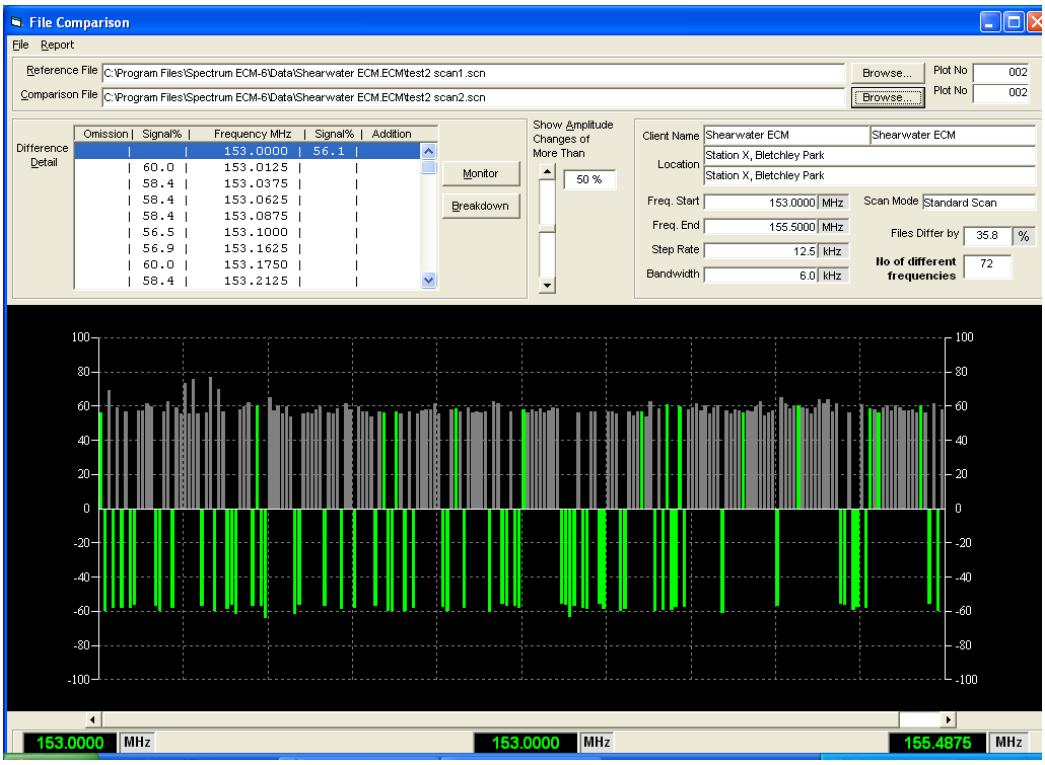
Comparing Data

This part of the program is for comparing data between two files. This is used to pinpoint frequencies that may have been overlooked, by being able to view additions and omissions

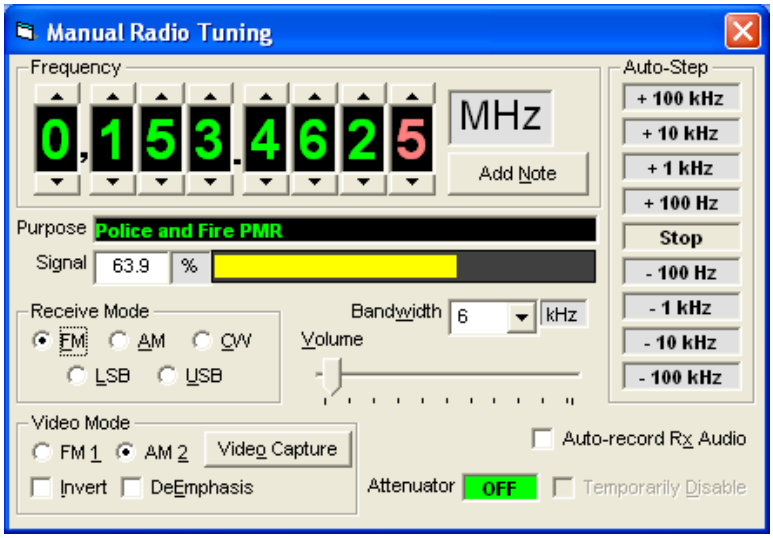


If you selected a Client name this will have been used to create a folder, with an (.ECM) suffix, for your results, if not, they will be in your default folder.

Using the Browse buttons will ease the selection of similar scans. The program will now compare the two files.



The differences are shown in the 'Difference Detail' box at the top, to listen to one of these, click on the frequency and press the 'Monitor' button. Control the volume by pressing Alt+V and using the right and left directional arrows.



You can fine-tune the frequency using the arrows above and below each number in the manual tune window.

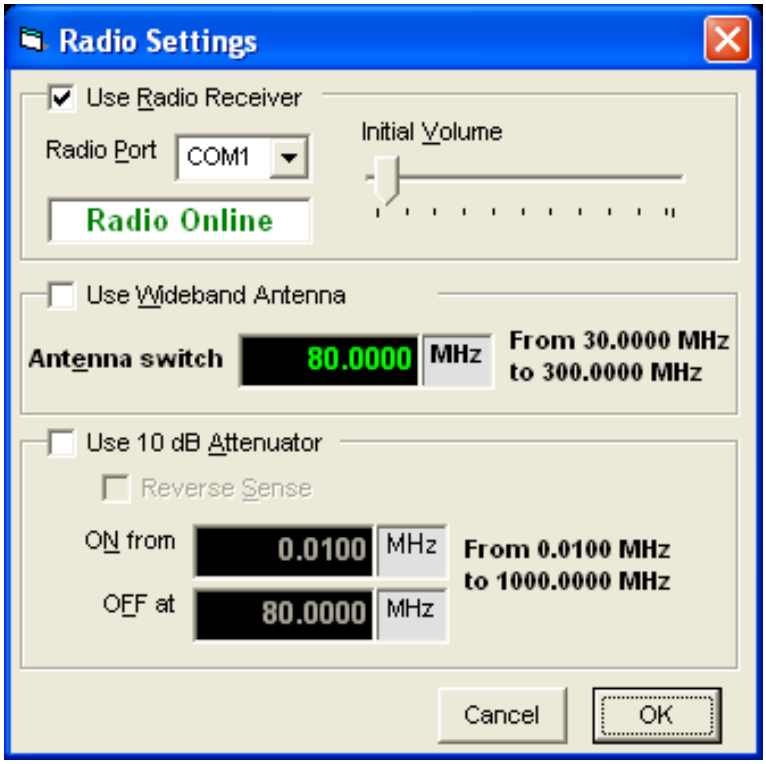
You can also see the number of different frequencies in a small box on the right of your screen.

To print in text or graph form, go to the Report tab at the top and choose your desired format. Cross off the window and you will return to the Main Data screen.

Program Configuration

Access these settings by clicking Tools and selecting Configurations.

Radio Settings



Starting from the top, you can see a 'Use Radio Receiver' check-box this will be ticked by default. To stop communication with the radio, untick this box.

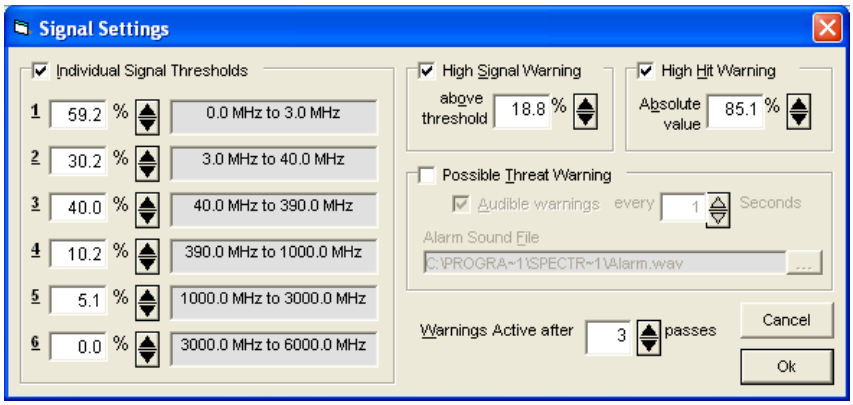
With the next box, you can choose the Radio Communications port, COM1, COM2, COM3, COM4, COM5, COM6, COM7, COM8 and COM9.

The volume control on the right is for the default volume setting, meaning the volume will automatically go to the level you set.

Below that, you will see another check-box, labelled 'Use Wideband Antenna'. If this is ticked, only the antenna connected to the UHF/VHF, connection will be employed. If it is left un-ticked then you can change the frequency that the VHF/UHF antenna is selected. Below this frequency the HF/VHF antenna will be selected.

The 10db attenuator need only be switched on if operations are being carried out in a very strong radio frequency environment.

Signal Settings


Signal Settings
Individual Signal Thresholds
1 59.2 % 0.0 MHz to 3.0 MHz
2 30.2 % 3.0 MHz to 40.0 MHz
3 40.0 % 40.0 MHz to 390.0 MHz
4 10.2 % 390.0 MHz to 1000.0 MHz
5 5.1 % 1000.0 MHz to 3000.0 MHz
6 0.0 % 3000.0 MHz to 6000.0 MHz
High Signal Warning
above threshold 18.8 %
High Hit Warning
Absolute value 85.1 %
Possible Threat Warning
Audible warnings every 1 Seconds
Alarm Sound File
C:\PROGRA~1\SPECTR~1\Alarm.wav
Warnings Active after 3 passes
Cancel
Ok

On the left, you have a choice of selecting the threshold levels for particular areas on the spectrum:

0 MHz	–	3 MHz
3 MHz	–	40 MHz
40 MHz	–	390 MHz
390 MHz	–	1000 MHz
1000 MHz	-	3000 MHz
3000 MHz	–	6000 MHz

The threshold (or squelch) is the level of signal deemed to be that transition between low signal, of little interest and a higher signal which is being sought.

The threshold level can be set globally, or over the five individual bands.

On the right side, are two frames, the first for High Signal% warning, and the second for High Hit% warning.

You can choose to have a Possible Threat Warning. This will display when both the High Signal% and High Hit% levels are encountered.

You can choose the alarm sound played when the Possible Threat Warning is displayed, it will be set to the default sound (alarm.wav). There are several alarm files to choose from the menu.

Scanner Options

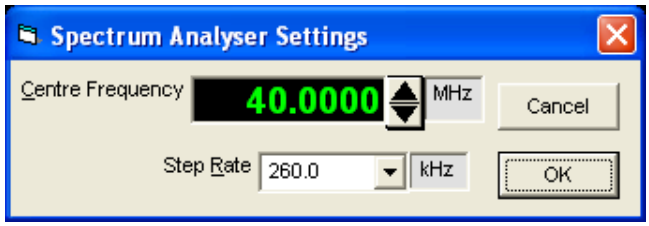
WARNING: Changing these settings, will seriously affect the program performance!

Firstly choose between scan receiver modes: FM (press Alt+F), AM (press Alt+A), LSB (press Alt+L), USB (press Alt+U), CW (press Alt+C).

The next setting is for how many times the signal is sampled. There is also a check-box to choose whether to bypass the locked-out frequencies.

We recommend scanning in AM, sampling once: for fast, reliable scanning.

Spectrum Analyser Settings



The options here are to change the default Centre Frequency and the Step Rate.

Reducing the Step Rate correspondingly reduces the bandwidth scanned.

Default Data Folder

With this you can choose which folder is automatically selected to save the data files in.

Auto-save Settings

Here you can choose to enable auto-save periodically and choose how often you want this to occur. You can also set the prefix for the filename.

This facility is well suited for unattended operation and attaining a history of spectral activity.

Band Description

These are radio frequency spectrum database files, the default file selected is UK_Bands.mdb which contains details of the UK frequency spectrum.

The data from the selected file is displayed in the Purpose box on various windows this corresponds to the current frequency being viewed or listened to.

The required band is selected by going to the main menu >Tools>Configuration>Band Description..
From the list highlight the required xxx.mdb file and click ‘Open’

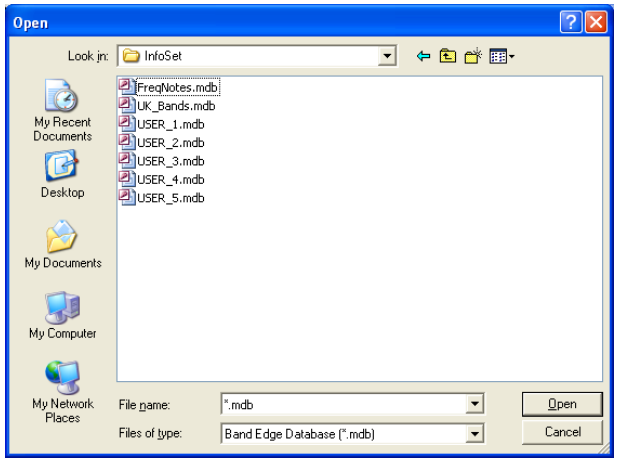
The band descriptions will now reflect the contents of the chosen xx.mdb file

There are five further files which can be used by the user to create foreign spectrum databases. To Edit these database files use the ‘Band Editor’ which can be found by going START > Programs > Shearwater ECM and clicking on ‘Band Editor’

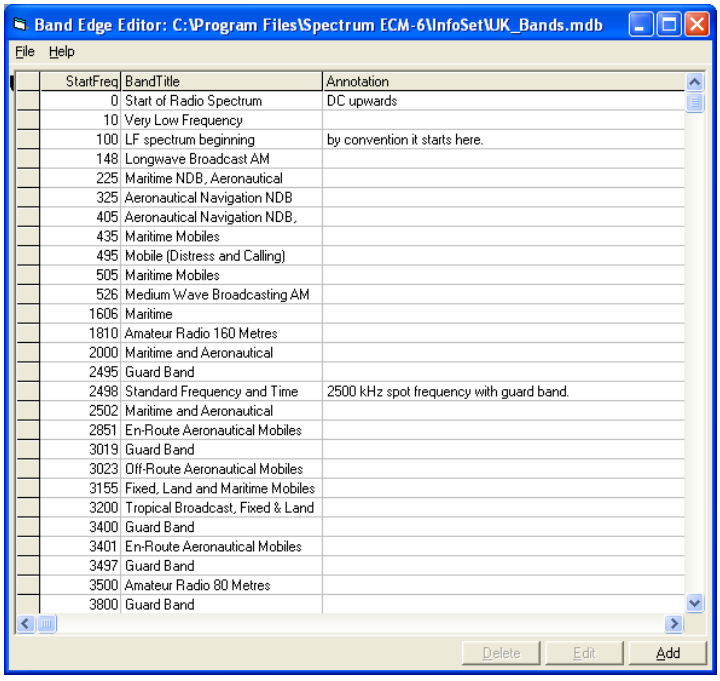
Band Editor Program

The Band Editor is used to edit radio frequency spectrum database files.
To load the program go to START > Programs > Shearwater ECM and click on 'Band Editor'

Load a database file by going to the main menu >File>Open



Choose a spare 'User' file. The file will load and the contents will be displayed as a list of frequencies and their uses.



StartFreq	BandTitle	Annotation
0	Start of Radio Spectrum	DC upwards
10	Very Low Frequency	
100	LF spectrum beginning	by convention it starts here.
148	Longwave Broadcast AM	
225	Maritime NDB, Aeronautical	
325	Aeronautical Navigation NDB	
405	Aeronautical Navigation NDB,	
435	Maritime Mobiles	
495	Mobile (Distress and Calling)	
505	Maritime Mobiles	
526	Medium Wave Broadcasting AM	
1606	Maritime	
1810	Amateur Radio 160 Metres	
2000	Maritime and Aeronautical	
2495	Guard Band	
2498	Standard Frequency and Time	2500 kHz spot frequency with guard band.
2502	Maritime and Aeronautical	
2851	En-Route Aeronautical Mobiles	
3019	Guard Band	
3023	Off-Route Aeronautical Mobiles	
3155	Fixed, Land and Maritime Mobiles	
3200	Tropical Broadcast, Fixed & Land	
3400	Guard Band	
3401	En-Route Aeronautical Mobiles	
3497	Guard Band	
3500	Amateur Radio 80 Metres	
3800	Guard Band	

To Add a frequency click the Add button the Band Edge Record window will open, type in the Start Frequency, Band Title and Annotation then click on Update.

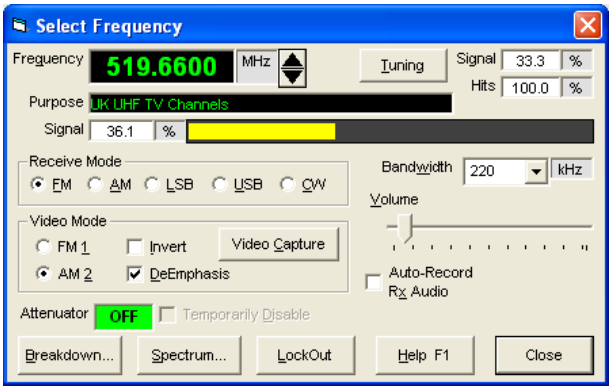
Note: The Frequency is entered in kHz

Edit a record by clicking on the frequency to be edited then click the Edit button. When the record has been edited click 'close' to write the record to the database.

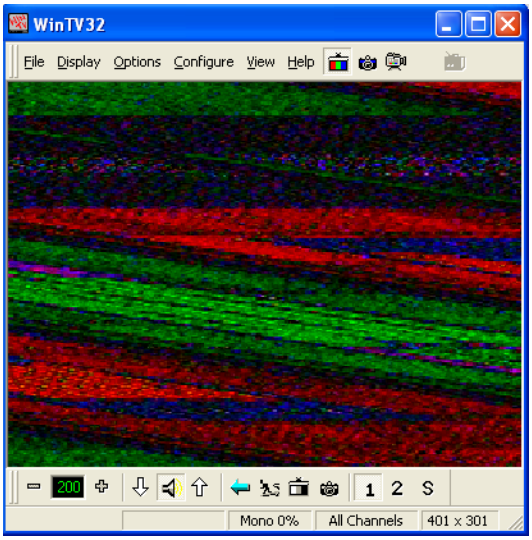
To Delete a frequency from the database, just click on the required frequency then click on the Delete button.

Exit the program by main menu >File>Exit. The information will be saved automatically.

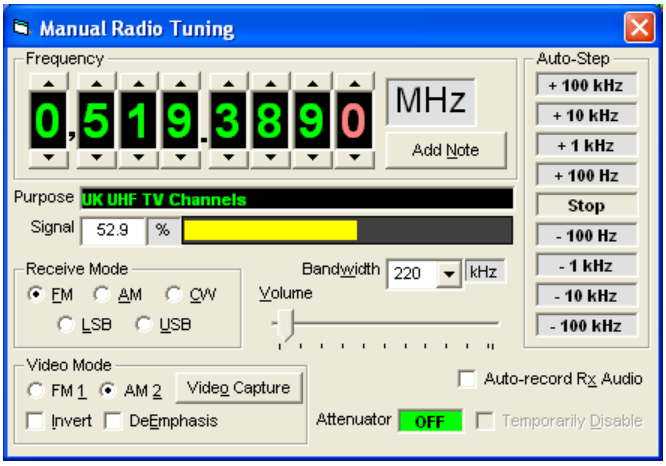
Video Demodulation



When you are tuned to a frequency, it can be analysed for video content. Click on the Video Capture button the Video Capture window will open.



There is a possibility that the frequency needs fine tuning. Click the Tuning button in the Select Frequency window the Manual Radio Tuning window should display.



Click the Tuning buttons above and below the displayed frequency until a clear picture is received. Also try to get a clear picture by selecting between AM and FM, or Invert the image or apply De-Emphasis.

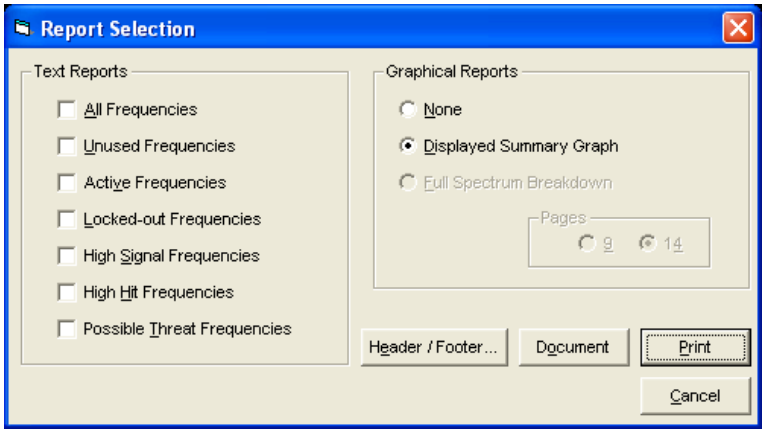
As a guide, UK broadcast TV is normal AM with De-emphasis, as is most broadcast TV. PAL transmissions will be seen as transmitted, SECAM and NTSC display in monochrome, and although it may not lock fully, will give a good indication as to what they are.

Clandestine video transmissions are most likely to be FM, and may be inverted.

Generating Reports

There are two types of reports that can be generated: RTF (Rich Text File) format or sending the report to a printer.

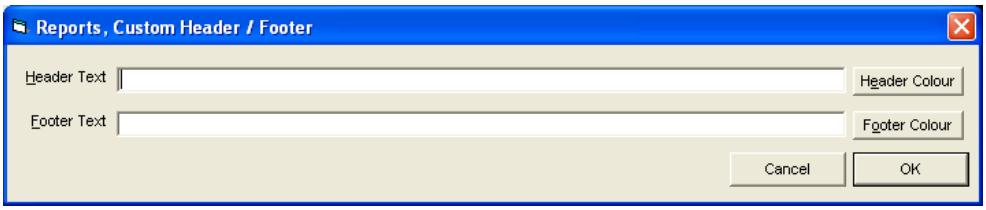
To access the ‘Report Selection’ window press ALT+F then R or by clicking File and selecting ‘Report Output’.



The following text reports can be selected: All Frequencies, Unused Frequencies, Active Frequencies, Locked-out Frequencies, High Signal Frequencies, High Hit Frequencies and Possible Threat Frequencies.

A Graph can also be included in the report by selecting the option ‘Displayed Summary Graph’. If a scan had been done between 10 kHz and 3000 MHz at 260 kHz then the ‘Full Spectrum Breakdown’ option will be available. This allows a graphical report to be printed over 9 or 14 pages.

The Header and Footer of the report can be personalised, this can be done by clicking on the ‘Header / Footer’ button and typing in to the ‘Header Text’ and ‘Footer Text’ boxes.



When finished click the ‘OK’ button.

To generate a document click on the ‘Document’ button the save window will open, type in the file name for the document then click on the ‘Save’ button. The generated file is saved as an RTF (Rich Text File). The file can be E-mailed or printed at a later date.

By clicking on the ‘Print’ button the report will be sent to a connected printer.

Specifications

Frequency coverage 10 kHz – 3000 MHz

Receive modes AM, FM, USB, LSB & CW

Nominal filter bandwidths 3 kHz, 6 kHz, 15 kHz, 30 kHz, 110 kHz & 220 kHz

Filter kHz	Total Nose Total Skirt (bandwidth kHz / dB)	
3	2.3 / -6	5.0 / -50
6	6.0 / -6	20 / -50
15	14 / -6	30 / -50
30	27 / -6	70 / -50
110	90 / -6	450 / -50
220	200 / -6	600 / -50

Receive Frequency	10dB S/N AM 6kHz	12dB SINAD SSB/CW 3kHz	12dB SINAD FM 15kHz	12dB SINAD FM 220kHz
10 kHz – 40 kHz	-	22.3 µV	-	-
40 kHz – 100 kHz	4.46	1.58	-	-
100 kHz – 2 MHz	2.23	0.71	-	-
2 MHz – 40 MHz	1.58	0.71	0.89	2.81
40 MHz – 1,000 MHz	0.89	0.4	0.5	1.58
1,000 MHz – 3.0 GHz	0.71	0.32	0.4	1.25

	Dimensions	Weight
Main Unit	360 x 355 x 115	7.5 kilos
Antenna	460 x 435 x 16	1.8 kilos
Transport Case	600 x 520 x 250	20 kilos complete system.

Designed and manufactured by

SHEARWATER TSCM
Station X
Innovation Centre
Bletchley Park
Sherwood Drive
Milton Keynes
MK3 6DS
United Kingdom

Tel: (IDD 44) (0)1908 677062 Fax: (0)1908 230732
Email: john@shearwatertscm.com Web: www.shearwatertscm.com